Claims

1. A method of controlling exposure in an x-ray apparatus, for imaging an object, the apparatus comprising an x-ray source and a displaceable detector being arranged to move with a controllable speed across an image exposure area, the method comprising the steps of:

   - starting a first scan and acquiring a signal relating to photons incident on at least a part of the detector,
   - comparing said acquired signal with a target value, and
   - controlling the displacement speed of detector with respect to the result of the comparison during said first scan.

2. The method of claim 1, wherein the target value is calculated from object thickness and spectrum incident on the object.

3. The method of claim 1, wherein the signal is acquired from a discrete number of regions on said detector.

4. The method of claim 1, wherein the detector is a photon-counting detector and the signal is the counted number of photons.

5. The method of claim 1, wherein the target signal is calculated to obtain a pre-defined signal to noise ratio (SNR).

6. The method of claim 1, wherein a distance the detector moves between readouts defines pixels in the scan direction, first dimension, and in a second dimension, the detector comprises actual pixels.

7. The method of claim 1, wherein the detector functions as an exposure control as well as an image receptor.

8. The method of claim 4, wherein based on the number of photons collected in a predefined region of the detector the scan velocity is modified.

9. The method of claim 8, changing scan-speed with respect to a count rate change in said region for controlling the number of counts reached per a first dimension pixel.

10. The method of claim 8, comprising a feedback from the displaceable detector based on the count rate in said region.

11. The method of claim 10, wherein said feedback is substantially real-time and controls the scan speed of the detector.

12. The method of claim 11, wherein the exposure of each point along an x-axis is controlled based on the count rate of the said region and thus the entire image has a controllable signal level along the first dimension at least in said region in the second dimension.

13. The method of claim 10, further comprising minimizing total scan time by areas not covered by dense objects being scanned faster and thus exposed shorter.

14. The method of claim 1, wherein said detector itself is used to control the exposure.

15. A method of controlling exposure time in an x-ray apparatus, the method comprising the steps of:
   a. setting a target signal (400),
   b. setting a detector Region Of Interest (ROI) (401),
   c. setting a start velocity (402),
   d. start scanning (403),
   e. collecting a signal from said ROI (404),
   f. compensating the signal with respect to at least one of ROI size and efficiency (405),
   g. comparing the signal with a target signal (S_{target}) and calculating a new optimal velocity (406), and
   h. setting a new velocity during said scanning.

16. The method of claim 15, wherein said step e comprises reading a number of counted photons or SNR.

17. The method of claim 15, wherein said x-ray apparatus is a photon counting device and the new velocity (V_{new}) is calculated as $V_{new} = V_{old} \times S_{target} / S_{measured}$.

18. The method of claim 15, wherein in said step g, if target signal is higher than measured signal (406') then velocity is decreased (4061') otherwise old velocity is kept (4062').

19. The method of claim 15, wherein said step g includes requiring new velocity to be at least higher than a pre-set minimum velocity.

20. The method of claim 15, wherein depending detector size the velocity decreases (4061"), if the target signal is higher than the measured signal (406") otherwise the velocity is increased (4062").

21. The method of claim 15, comprising the alternative step g of:
   o collecting a compression height ($h_{compression}$) data, projection and data about an examination type (4062'''),
   o collecting from previous examinations (4063'''), based on previous step, typical examination object density profile ,
   o calculating (4064''') an optimal velocity profile based on estimation of said density profile and measured signals, and
   o calculating new velocity based on the above data

22. The method of claim 15, wherein said step of choosing the ROI includes:
   - deciding an scan direction,
   - choosing ROI that will enter the object first, and
   - checking that ROI has sufficient number of detector elements working else choosing next appropriate ROI.

23. An arrangement for controlling exposure time in an x-ray apparatus (100), which comprises an x-ray source (110) and a displaceable detector (150), being arranged to be displaced with a controllable speed across an image exposure area, characterised in
that the arrangement comprises means (802) for receiving detected signals by said detector, which includes a comparator unit for comparing said acquired signal with

a target value during a scan, and means (804) for controlling the speed of said detector displacement during said scan with respect to the result of the comparison.

24. The arrangement of claim 23, wherein said means for receiving detected signals is a processing unit and said means (804) for controlling the detector replacement is a motor controller.

25. The arrangement of claim 23, wherein said displacement controller controls rotation of said detector having a rotation centre in said x-ray source.

26. An X-ray apparatus (100) of a photon counting type, comprising an x-ray source (101) and a displaceable detector (105) being arranged to move with a controllable speed across an image exposure area, characterised by an arrangement for counting the number of photons detected by the detector, means (802) under a scanning movement for comparing the counted number of photons with a pre-set value, and means (803) for controlling the speed of detector displacement with respect to a result obtained from the density of an object to examined under said scanning movement.

27. A computer useable medium having computer readable program code embodied therein to enable controlling exposure in an x-ray apparatus, when imaging an object, the apparatus comprising an x-ray source, a displaceable detector, the computer program code being arranged to control displacement of said detector array with a controllable speed across an image exposure area, the computer program code comprising: an instruction set for acquiring a signal relating to photons incident on at least a part of the detector under a scanning movement, an instruction set for comparing said acquired signal with a target value, and instruction set for controlling the speed of detector displacement with respect to the result of the comparison under said scanning movement.

28. A computer useable medium having computer readable program code embodied therein to enable controlling exposure in an x-ray apparatus, for imagining an object, the apparatus comprising an x-ray source and a displaceable detector being arranged to move with a controllable speed across an image exposure area, said code comprising: a first instruction set for acquiring a signal relating to photons

incident on at least a part of the detector under a scanning movement, a second instruction set for comparing said acquired signal with a target value, and a third instruction set for controlling the speed of detector displacement with respect to the result of the comparison under said scanning movement.

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29. A computer program for controlling exposure in an x-ray apparatus, when imaging an object, the apparatus comprising an x-ray source, a displaceable detector, the computer program being arranged to control displacement of said detector array with a controllable speed across an image exposure area, the computer program
10   comprising: an instruction set for acquiring a signal relating to photons incident on at least a part of the detector under said scanning movement, an instruction set for comparing said acquired signal with a target value, and instruction set for controlling the speed of detector displacement with respect to the result of the comparison under said scanning movement.

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30. A computer program for controlling exposure in an x-ray apparatus, for imagining an object, the apparatus comprising an x-ray source and a displaceable detector being arranged to move with a controllable speed across an image exposure area, said program comprising:
20   -   a first instruction set for acquiring a signal relating to photons incident on at least a part of the detector under a scanning movement,
       -          a second instruction set for comparing said acquired signal with a target value, and
       -          a third instruction set for controlling the speed of detector displacement with
25   respect to the result of the comparison under said scanning movement.